OUTLINE SHEET 4-7-1
Surface Preservation

A. Introduction

The warships used by the Navy is made of steel and is expected to last for decades in saltwater. Surface preservation plays a very important part in extending the life and operational preparedness of the ships and its equipment. These lesson covers the basic aspects of surface preservation.

B. Enabling Objectives

4.17 **STATE** the purpose of cleaning and preservation.

4.18 **DESCRIBE** equipment required and procedures necessary for preparing and painting a surface.

4.19 **DESCRIBE** the procedures for preserving unpainted surfaces.

4.20 **DESCRIBE** the procedure for cleaning and stowing painting equipment.

4.21 **DESCRIBE** safety precautions used in the vicinity of painting materials.

C. Topic Outline

1. Introduction
2. Overview
3. Cleaning
4. Painting
5. Surfaces Not to be Painted
6. Summary and Review
7. Assignment

ASSIGNMENT SHEET 4-7-2
Surface Preservation

A. Introduction

This material is to be completed prior to the material being covered in class.

B. Enabling Objectives

Refer to enabling objectives in Outline Sheet 4-7-1.

C. Study Assignment

1. Read Information Sheet 4-7-3

D. Study Questions

1. What is the purpose of cleaning?
2. What are the ingredients of paint?
3. What are the tools used for removing paint from large areas?

INFORMATION SHEET 4-7-3
Surface Preservation

A. Introduction

This information describes surface preservation.

B. Reference

Basic Military Requirements NAVEDTRA 12043

C. Information

I. Navy ships operate in a very harsh environment.
   A. Saltwater can quickly turn the exterior of a ship into a mass of rust.
   B. The interior of the ship is constantly exposed to moisture, humidity and chemical reactions that affect electrical systems and machinery.

II. To overcome these conditions, the Navy spends a lot of time, effort, and resources in applying surface preservatives. These preservatives range from soap and freshwater, lubricants, and paints.

III. Cleaning improves the appearance and sanitary condition of the ship.
   A. It aids in the preservation of the ship by extending paint life.
   B. It helps prevent overheating of electrical machinery and abrasion of rotating equipment.

IV. Dirt, soil and contamination all describe the same thing, a foreign material where it is not wanted. It includes unwanted grease and oil, rust, food, residue, and stains.

V. Most soiled surfaces are cleaned using cleaning agents such as detergent and water.
   A. The wetting ability of water is greatly improved through the use of detergents which allows the water to flow into crevices and around small particles of soil.
   B. Scrubbing and rubbing loosen the dirt through mechanical action.
   C. Rinsing removes loosened dirt along with the cleaning material.

VI. Paint is used primarily for preservation of surfaces.
   A. It seals the pores of steel and other materials.
   B. It prevents decay, rust and corrosion.
   C. It aids in cleanliness and sanitation due to its antiseptic properties. It provides a smooth, washable surface.

VII. Paint consists of four essential ingredients:
- A. The pigment provides the coloring of the paint. In primers, it helps prevent rust.
- B. The vehicle or base is the liquid portion of the paint. It wets the surface being painted and ensures adhesion.
- C. The driers are metallic compounds added to the paint to speed up the drying process.
- D. Thinners are used to thin the paint to the proper degree for spraying, brushing or rolling.

VIII. Most Navy paints are named by the color of the paint and/or its use..
- A. Primers are base coats of paint that stick firmly to bare woods and metals.
  1. They provide a smooth surface for finishing coats.
  2. They seal the pores and serve as rust inhibitor on metals.
- B. Synthetic paints are paints such as epoxies and urethane. They are mixed with a converter (hardener) just prior to use. They are used in areas subject to severe exposure such as:
  1. bilges
  2. tanks
  3. decks.
- C. Exterior paints are used for areas above the waterline of the ship.
- D. Interior paints are used inside the skin of the ship.

IX. For paint to stick to a surface, all salt, dirt, oil, grease, rust, and loose paint must be removed from the surface.
- A. Salt and most dirt can be removed with detergent and freshwater.
- B. The removal of rust, scale, and loose paint requires the use of tools and/or paint removers.

X. The hand tools most commonly used to remove paints are sandpaper, wire brushes and hand scrapers.
- A. Sandpaper is used to clean corners. It is also used to taper the edges of chipped areas down to the clean surface so that no rough edges remain. Paints bonds best to a clean surface that has been lightly sanded.
- B. Wire brush is used for light work on rust or on light coats of paint. It is also used for brushing weld spots and cleaning pitted surfaces.
- C. The most common hand scraper is the L-shaped tool steel bar. Each end is tapered to a cutting edge. It is used when the use of power tools to remove paint is impractical or impossible.

XI. Power tools are used to quickly remove paint from large areas.
- A. The portable grinder may be equipped with different attachments such as grinding wheel, wheel brush and wheel cups.
- B. A chisel used with pneumatic hammer must be held in such a way that it strikes the surface at 45 degrees.

C. A portable pneumatic scaler (needle gun) uses needles to clean weld seams, remove paint and rust, and to dress concrete and masonry.
D. The rotary scaling and chipping tool (deck crawler) has a bundle of cutters and chippers mounted on either side. It is particularly useful in large deck areas.

XII. The most important task in painting a steel surface is surface preparation.
A. It must be completely free of:
1. rust
2. loose paint
3. dirt
4. scale
5. oil
6. grease
7. salt deposits
8. moistures
B. If old paint is not to be removed, the surface must be smoothed, cleaned, and dried before new paint is applied.

XIII. In touch-up painting, the old paint must be removed up to the area where the paint is completely intact. There must be no rust or blisters underneath the areas to be painted.

XIV. Steps in reworking an old painted surface:
A. Take the surface down to bare metal.
B. Apply primer before painting.
C. Never leave bare metal exposed overnight - apply primer coat before securing for the day.

XV. Painting can be dangerous to careless personnel. Many paints are highly flammable and/or poisonous.
A. Avoid getting paint on your skin. Wash your hands, arms and face with soap and water before eating. Do not put any paint-contaminated item in your mouth.
B. Ensure adequate ventilation. Wear an approved paint/spray respirator as required. Leave the space for fresh air at first sign of dizziness.
C. Do not smoke, use an open flame or use spark producing tools in the vicinity of painting operations.
D. Use only explosion-proof lights near painting operations.
E. Do not wear nylon, orlon, plastic, and other clothing that can generate static electricity that may ignite paint vapors.
F. Steel buttons and buckles can generate sparks invisible to the eye but can ignite paint vapors.
G. When pouring solvents, make sure the containers are touching each other to prevent sparks.
H. Do not use gasoline, turpentine, mineral spirits, and other solvents to remove paint from skin, as the skin will absorb them.

XVI. Paint may be applied by using brushes, rollers, or by spraying. Spray painting is not going to be discussed in this lesson

XVII. Smooth and even painting depends on good brush stroke.
- A. Hold the brush properly.
- B. Dip the brush up to the half-way point and remove excess paint by patting the brush inside the pot. Overfilling the brush will cause paint to drip on the handle and onto the deck.
- C. Hold the brush at right angle to the surface being painted, with the end just touching the surface.
- D. Lift the brush off the surface at the end of each stroke to prevent uneven application of paint.
- E. “Lay on” the paint by applying it in long strokes in one direction first.
- F. “Lay off” the paint by crossing the first stroke to ensure even distribution of paint.
- G. To avoid brush marks when finishing an area, use strokes toward the last section painted.

XVIII. Always paint the overhead first.
- A. This allows paint to be wiped off the bulkhead without smearing fresh paint.
- B. Start from the corner farthest away from the entrance
- C. Paint the angle between the overhead and the bulkhead using fairly long and smooth strokes. Using slow strokes will cause the line to be wavy.

XIX. Paint rollers are used on large areas that are free of impediments such as pipes, cables, and bolts.
- A. The paint is laid on and laid off in the same manner as brushes
- B. Use a moderate amount of pressure on the roller to ensure the paint is worked on to the surface.
- C. Using inadequate pressure will cause the paint not to stick and soon peels off.

XX. The following items must not be painted:
- A. Start-stop mechanisms of electrical safety devices and control switchboards on machinery elevators
- B. Bell pulls, sheaves, annunciator chains, and other mechanical communication device
- C. Composition (stainless steel) metal water ends of pumps
- D. Condenser heads and outside surfaces of condensers made of composition metal
- E. Exposed composition metal parts of any machinery
- F. Glands, stems, yokes, toggle gear, and all machined external parts of valves
- G. Heat exchange surfaces of heating and cooling equipment
- H. Identification plates
- I. Joint faces of gaskets and packing surfaces
- J. Lubricating gear, such as oil holes, oil or grease cups, grease fittings, lubricators, and surfaces in contact with lubricating oil

K. Machined metal surfaces (working surfaces) of reciprocating pumps or engines
L. Metal lagging
M. Rods, gears, universal joints, and coupling of valve operating gear
N. Rubber element of isolation mounts
O. Ground plates
P. Springs
Q. Threaded parts
R. Zincs
S. Working surfaces
T. Hose and applicator nozzles
U. Knife edges, rubber gaskets, drop bolts, wedges, operating gear of watertight doors, hatches, scuttles
V. Flexible hoses
W. Electrical contact points and insulators